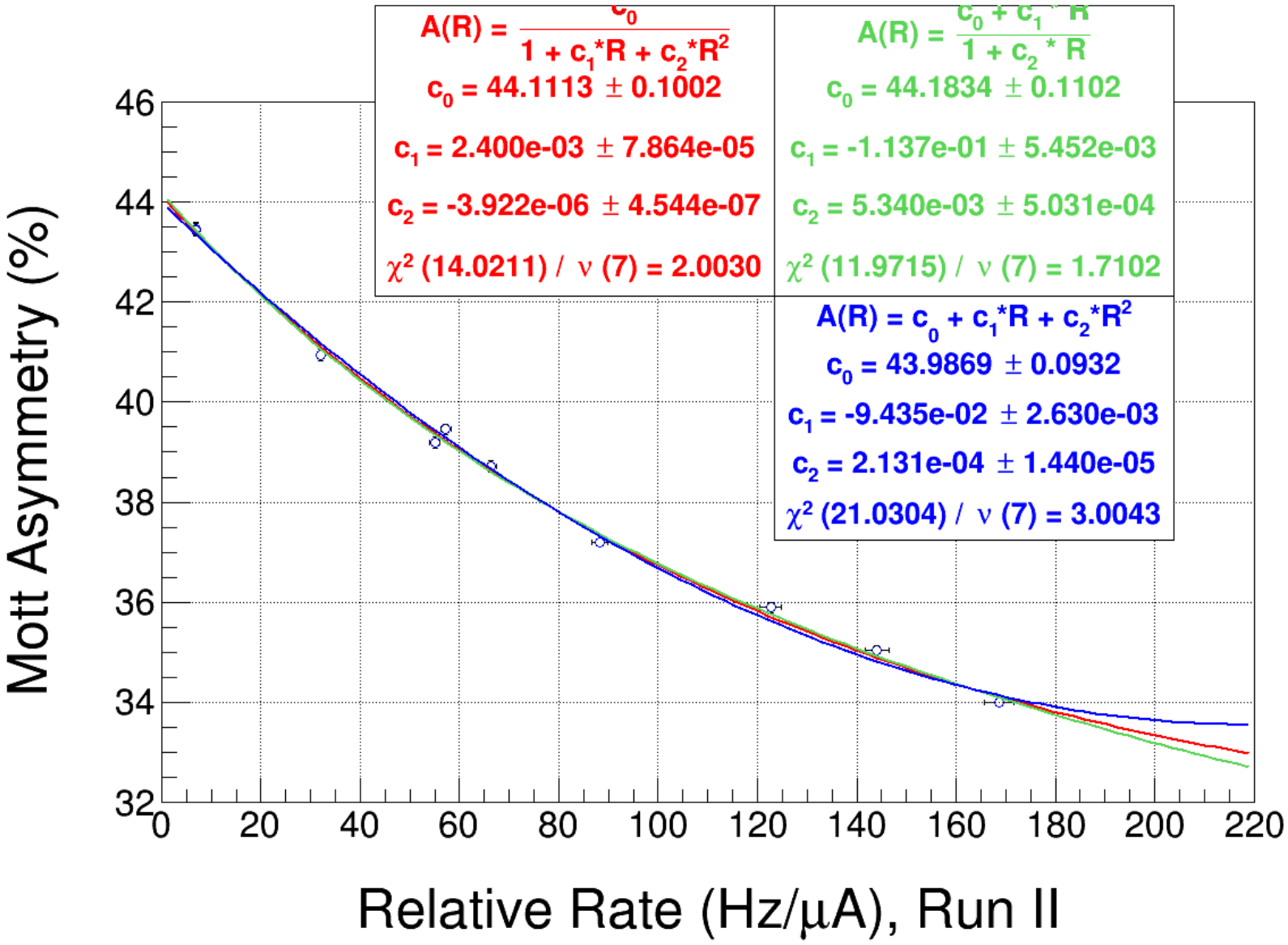
Status of Instrumental Beam Studies and Technical Description of Detectors and DAQ

February 24, 2017

Official Run II



Rate Systematic Studies

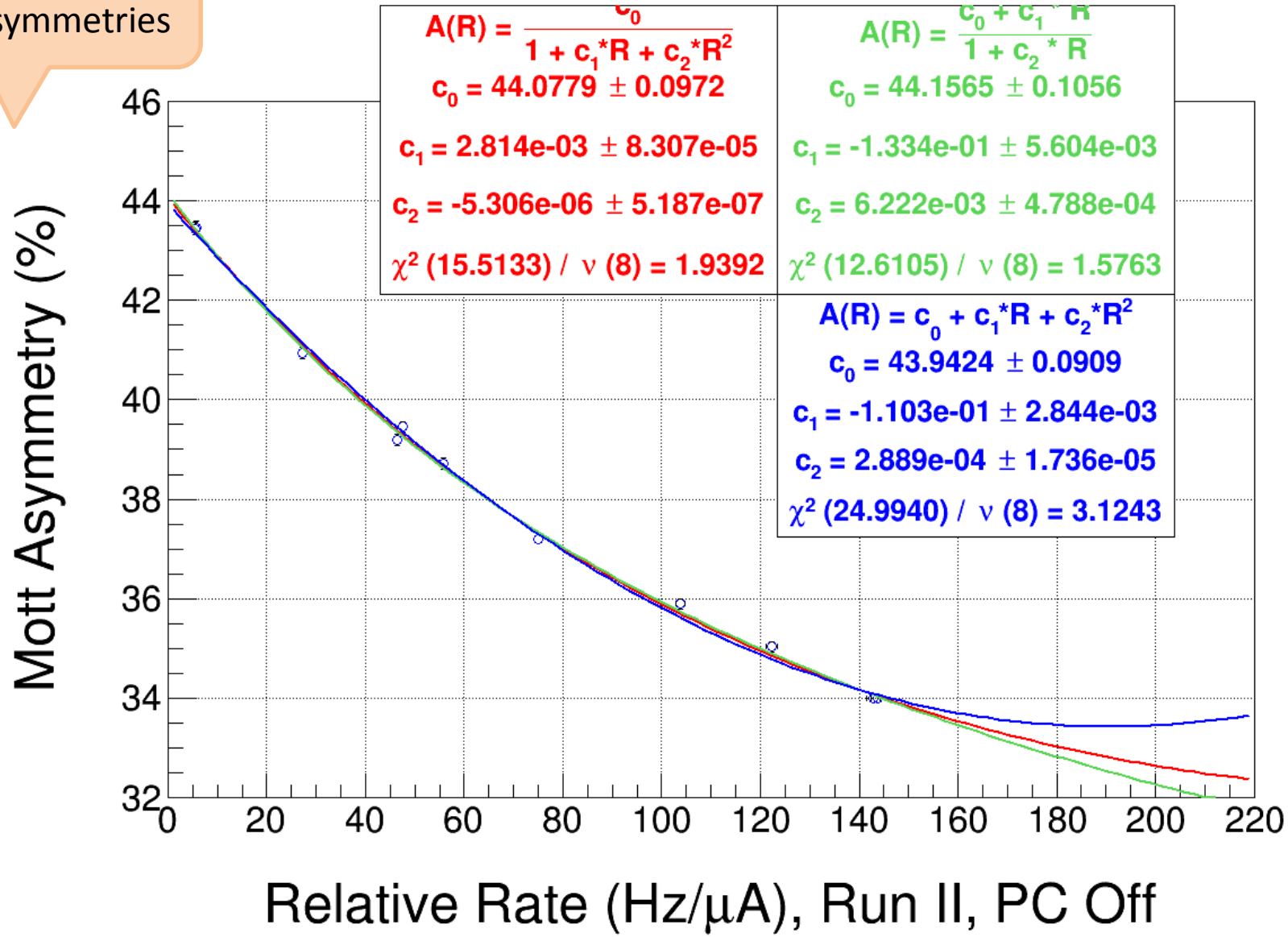
I. **Run II:**

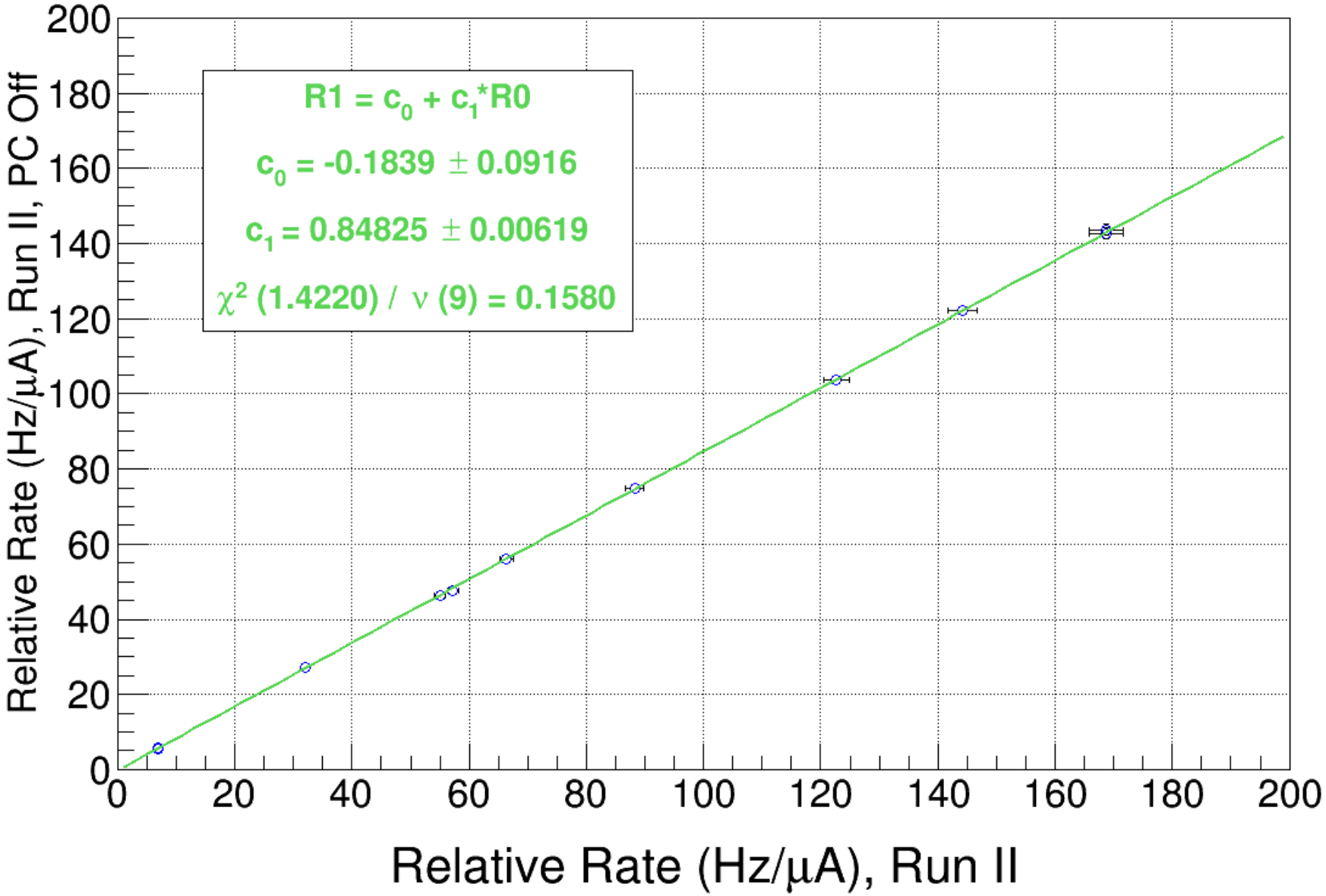
I. Relative rate scan of all foils at constant beam current of 1 μA with Pockels Cell OFF: 8413 – 8424

II. Relative rate scan of all foils at constant beam current of 1 μA and no timing veto: 8548 – 8560

PC Off Rates

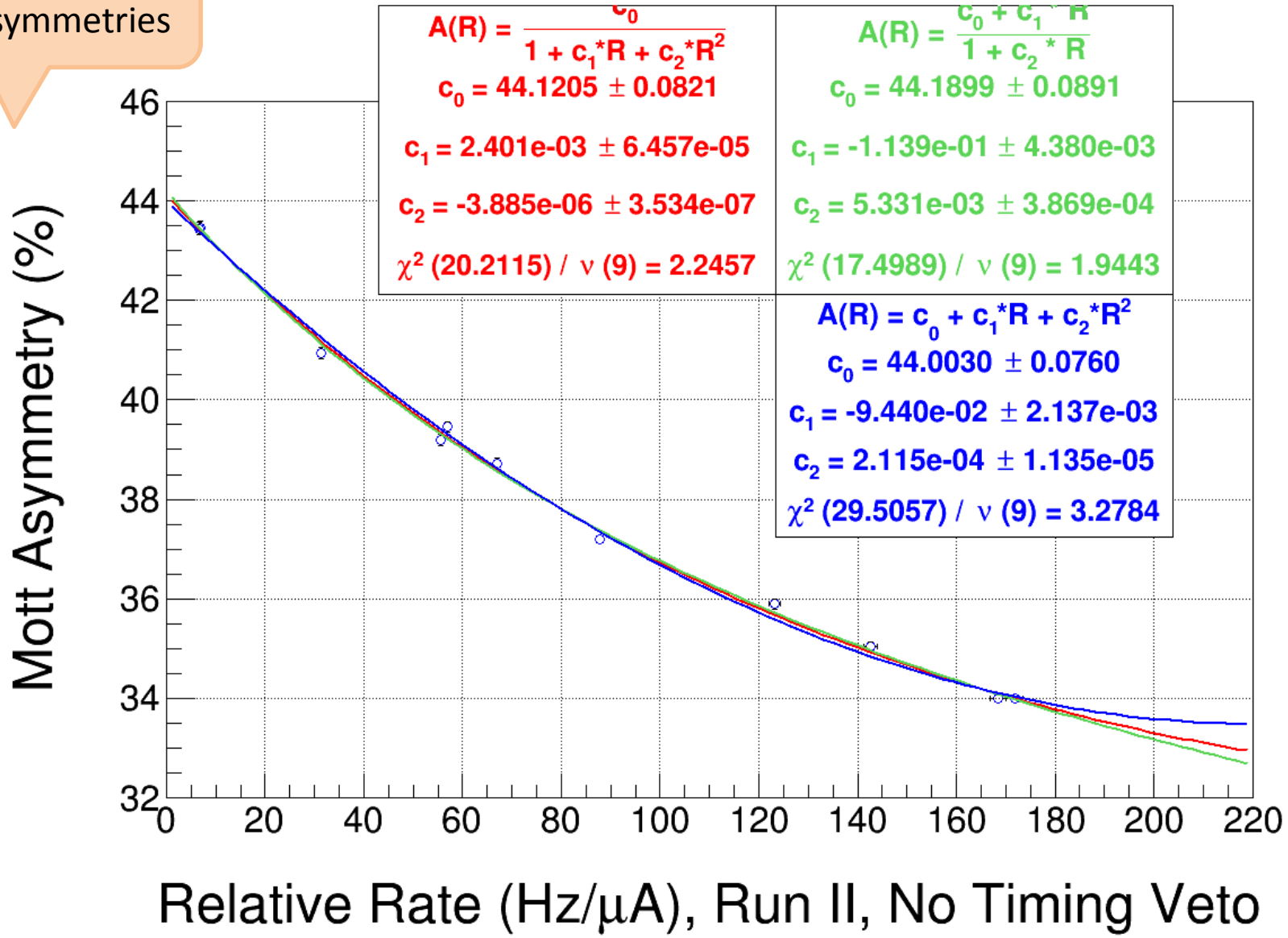
With official asymmetries

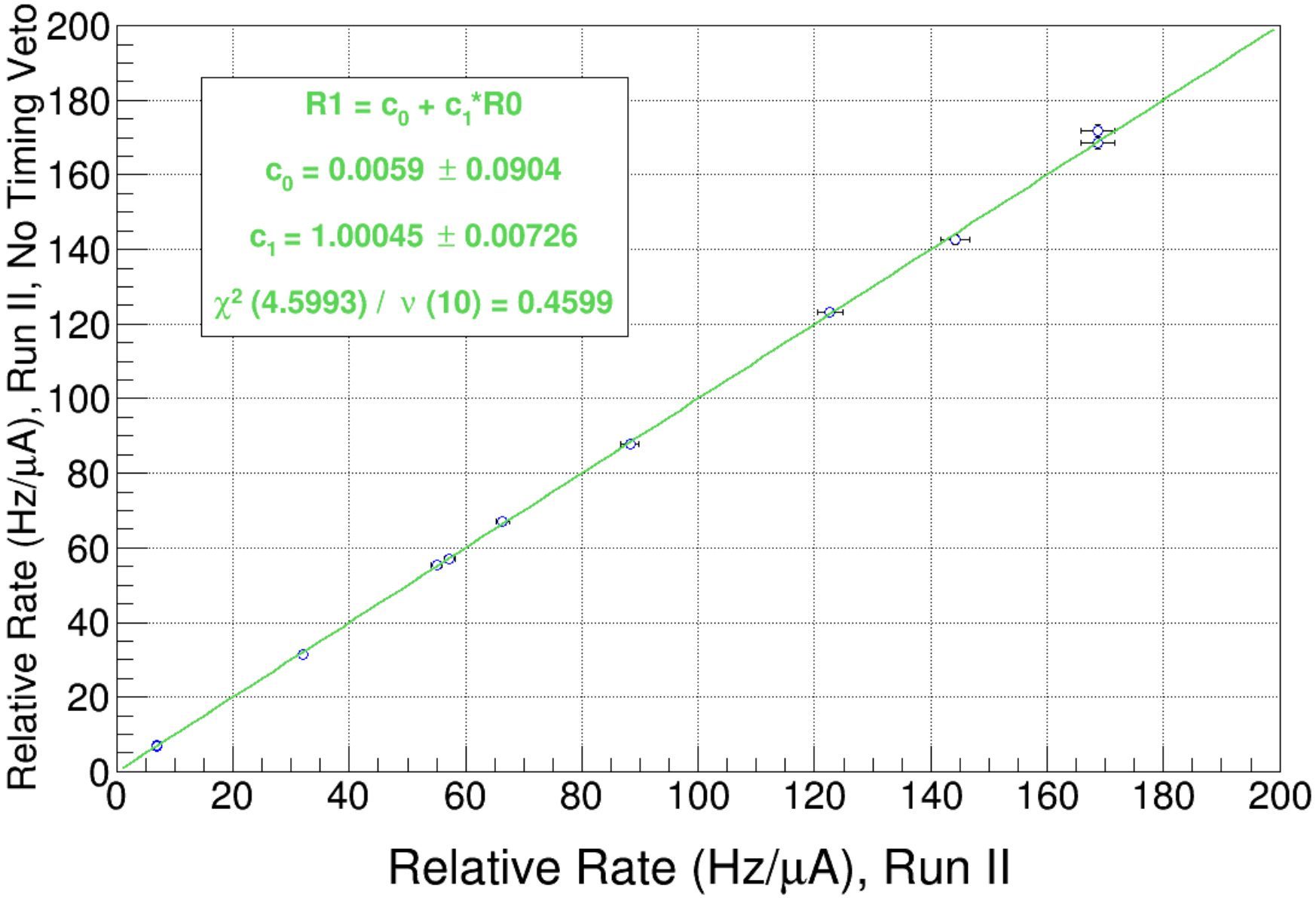



R1 = c0 + c1*R0
c0 = -0.1839 ± 0.0916
c1 = 0.84825 ± 0.00619
χ² (1.4220) / ν (9) = 0.1580
Relative Rate (Hz/μA), Run II, PC Off
Relative Rate (Hz/μA), Run II
0
20
40
60
80
100
120
140
160
180
200

No Timing Veto Rates

With official asymmetries




R1 = c0 + c1*R0
c0 = 0.0059 ± 0.0904
c1 = 1.00045 ± 0.00726
χ² (4.5993) / ν (10) = 0.4599
Relative Rate (Hz/μA), Run II, No Timing Veto
Relative Rate (Hz/μA), Run II
0
20
40
60
80
100
120
140
160
180
200

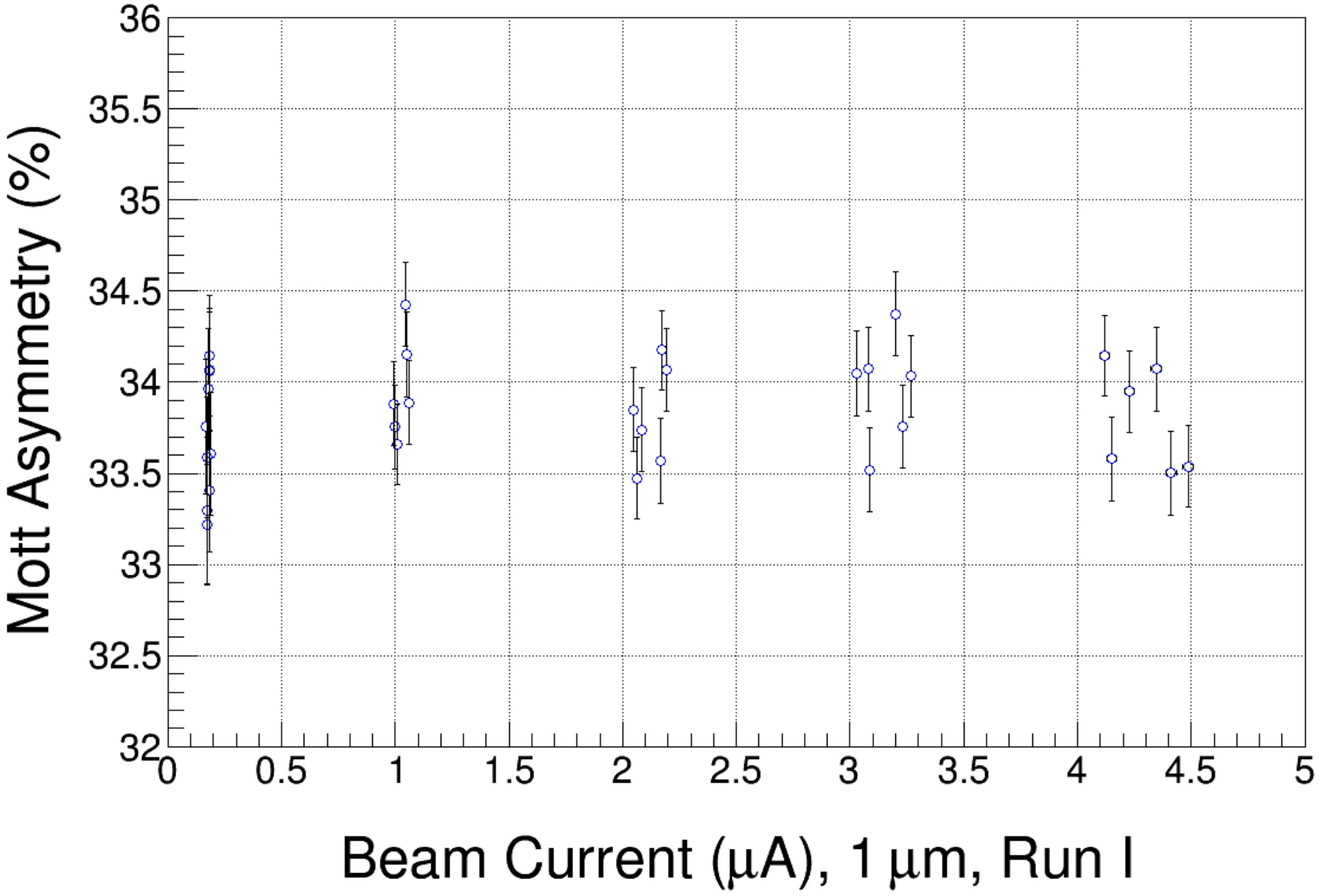
Summary

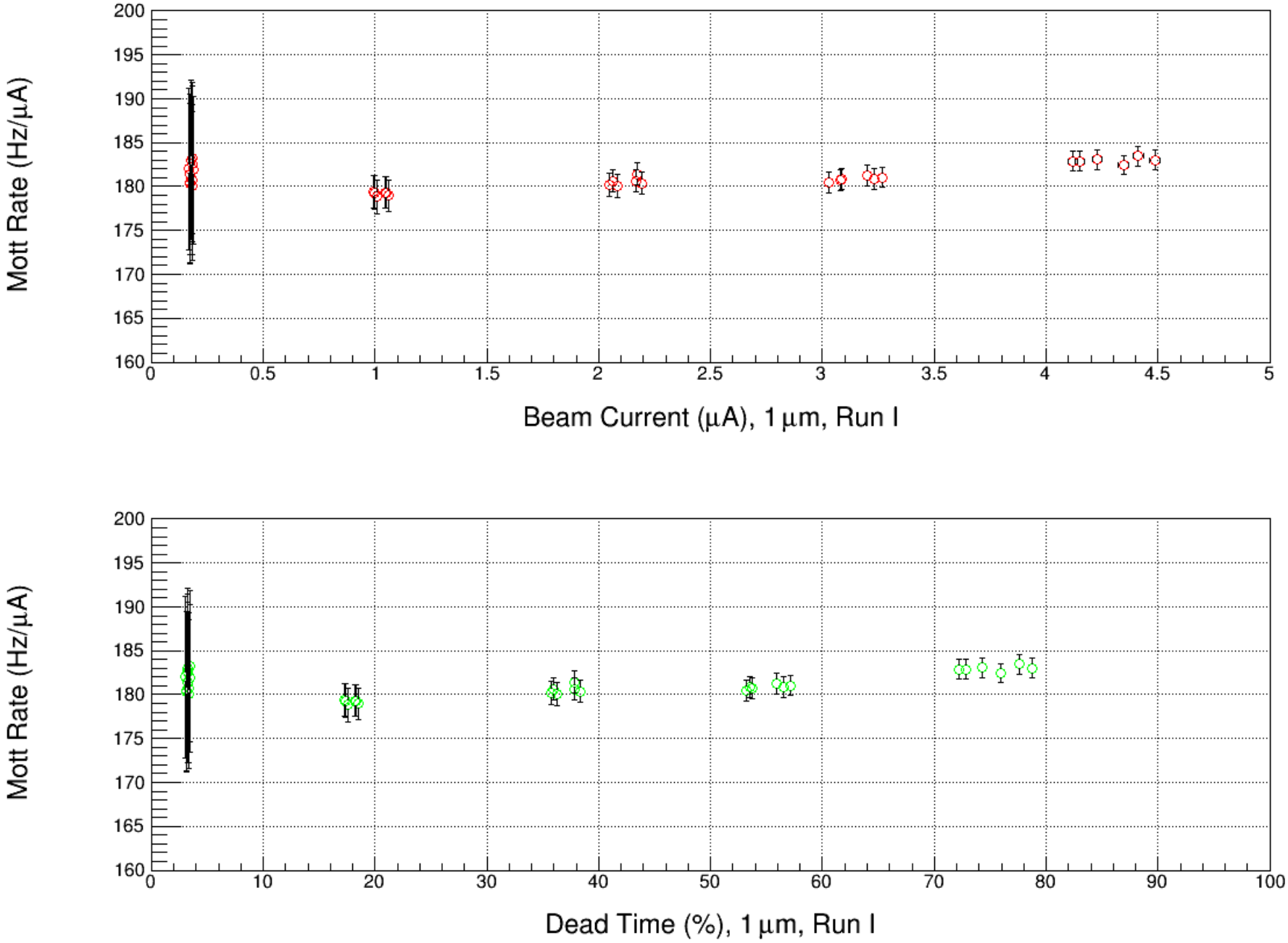
I. Relative rates depend on range of Gaussian fit of energy spectra (i.e., 7500-11000 or 8000-9000) since each fit-range gives different mean and sigma

II. RUN II rate scan with Pockels Cell Off – taken at start of RUN II with initial beam steering – is very consistent with rates from asymmetry runs and with correction applied

III. Run II rate scan with no timing veto – taken at end of RUN II – is very consistent with rates from asymmetry runs and with correction applied

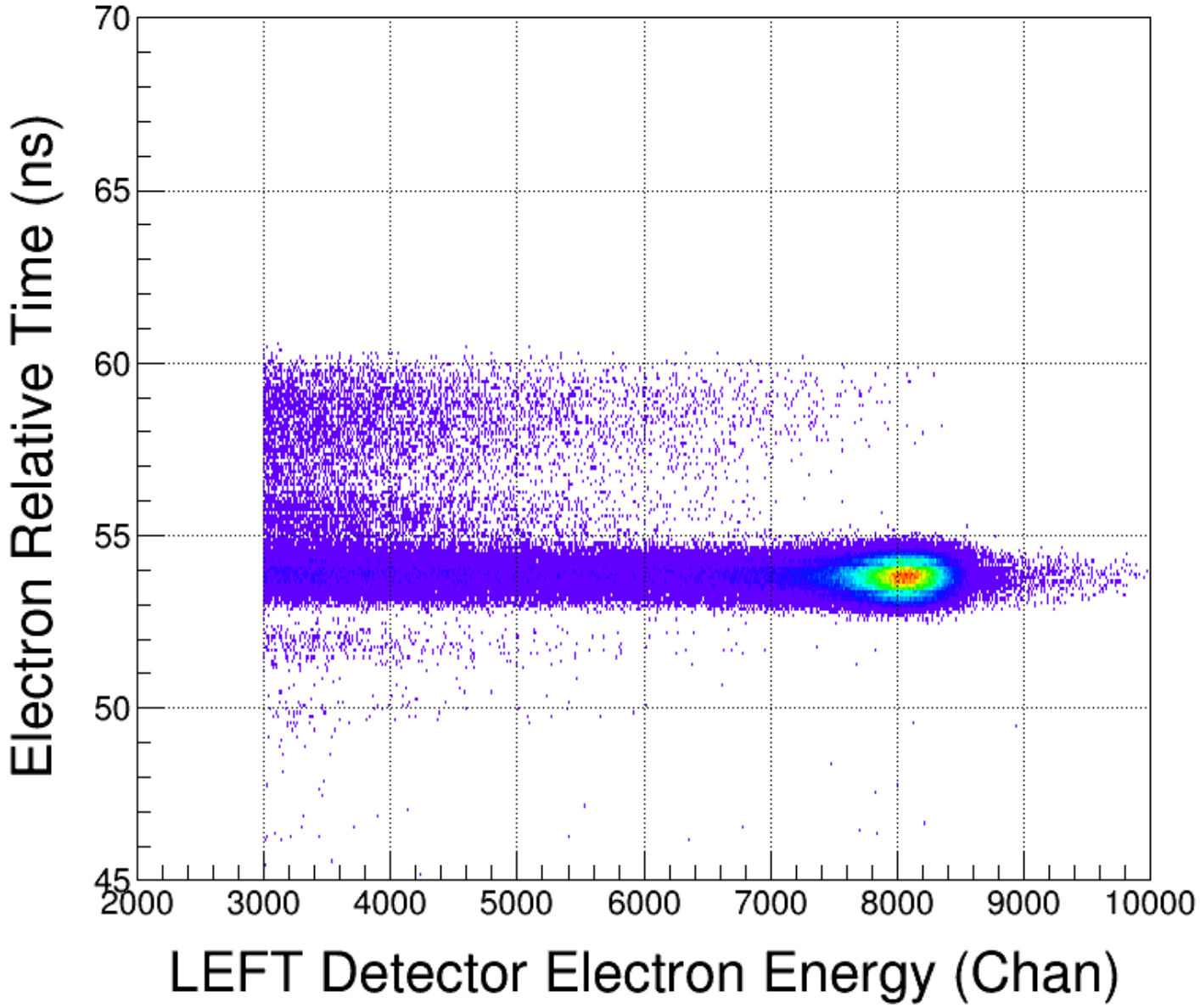
DAQ Dead Time Study

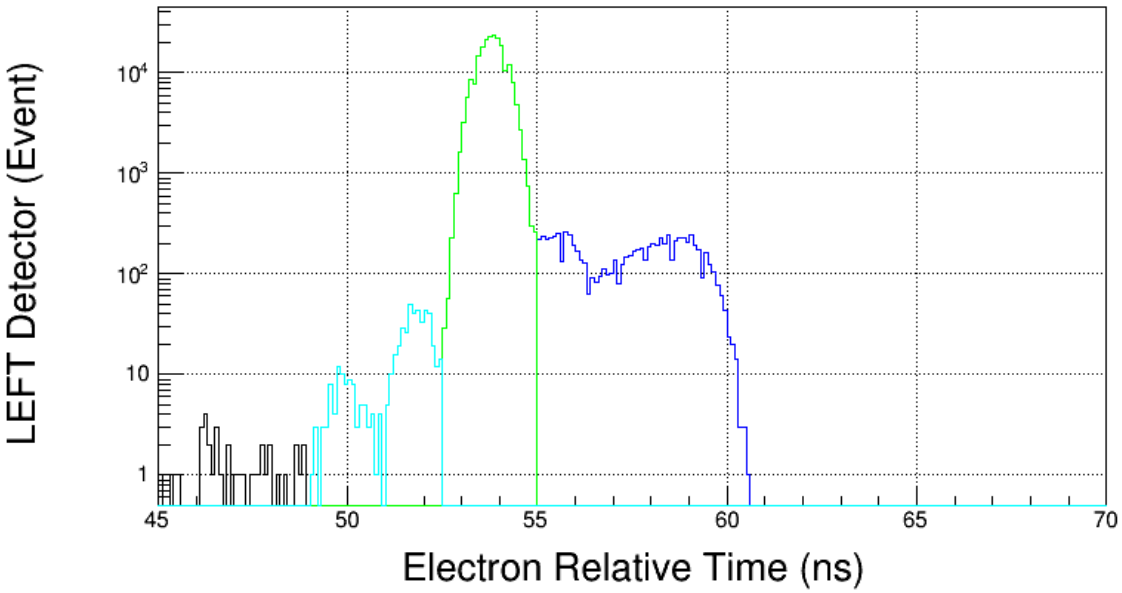

Mott Asymmetry (%)
36
35.5
35
34.5
34
33.5
33
32.5
32
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Beam Current (μA), 1 μm, Run I

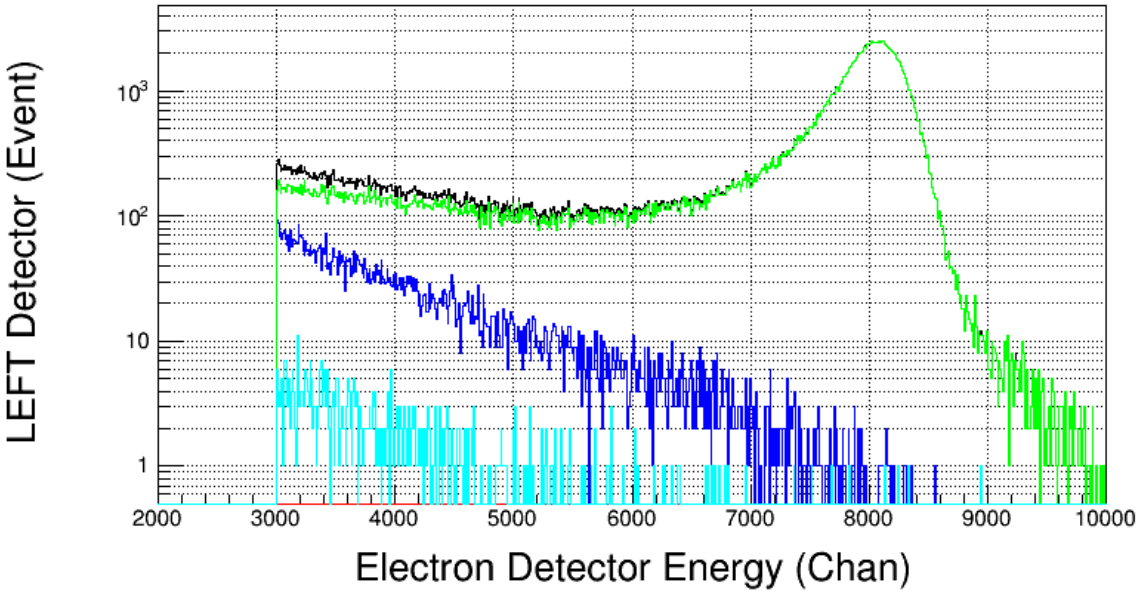

Mott Rate (Hz/μA)
200
195
190
185
180
175
170
165
160
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Beam Current (μA), 1 μm, Run I
Mott Rate (Hz/μA)
200
195
190
185
180
175
170
165
160
0
10
20
30
40
50
60
70
80
90
100
Dead Time (%), 1 μm, Run I

Energy vs Time-of-flight

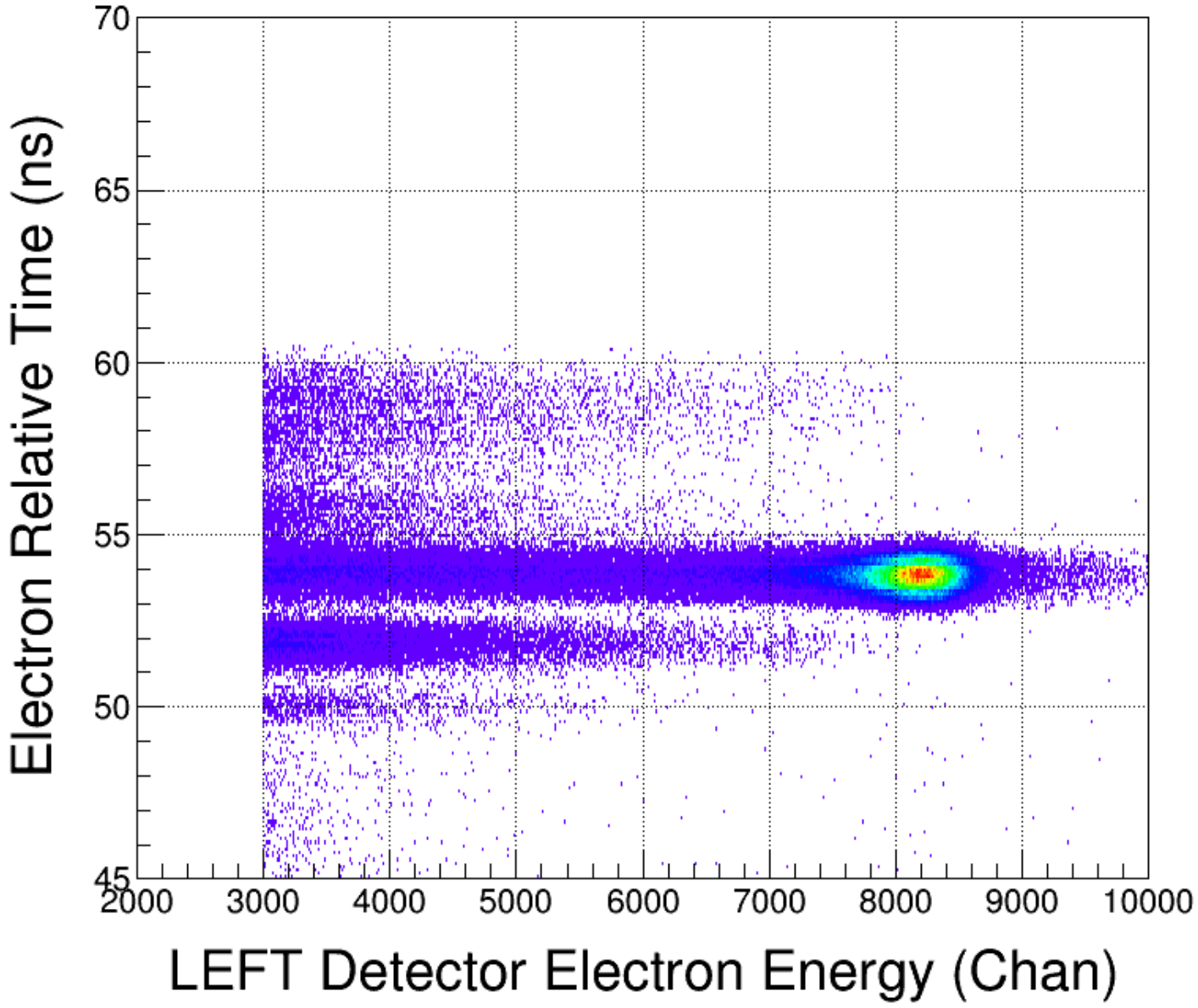
8545

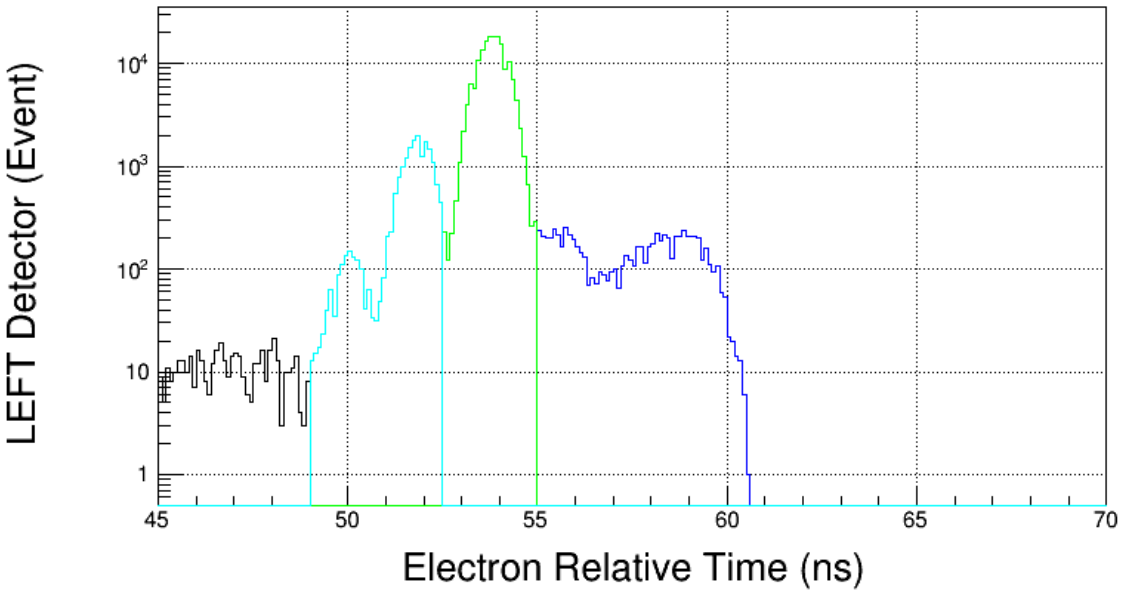

Electron Relative Time (ns)
70
65
60
55
50
45
2000
3000
4000
5000
6000
7000
8000
9000
10000
LEFT Detector Electron Energy (Chan)

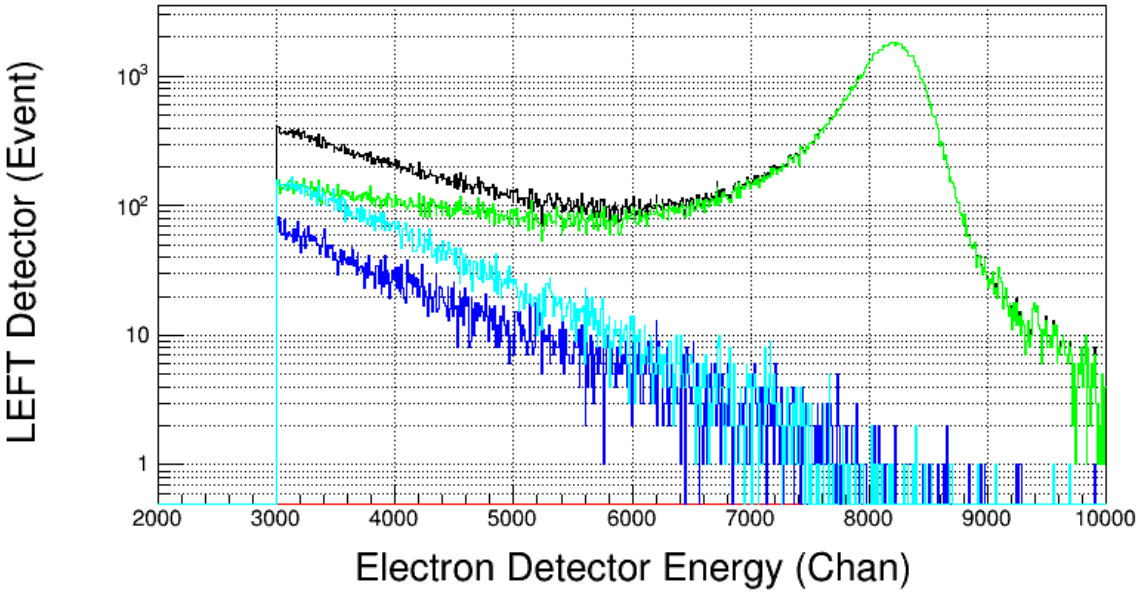

LEFT Detector (Event)
10^4
10^3
10^2
10
1
45
50
55
60
65
70
Electron Relative Time (ns)


LEFT Detector (Event)
10^3
10^2
10
1
2000
3000
4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)

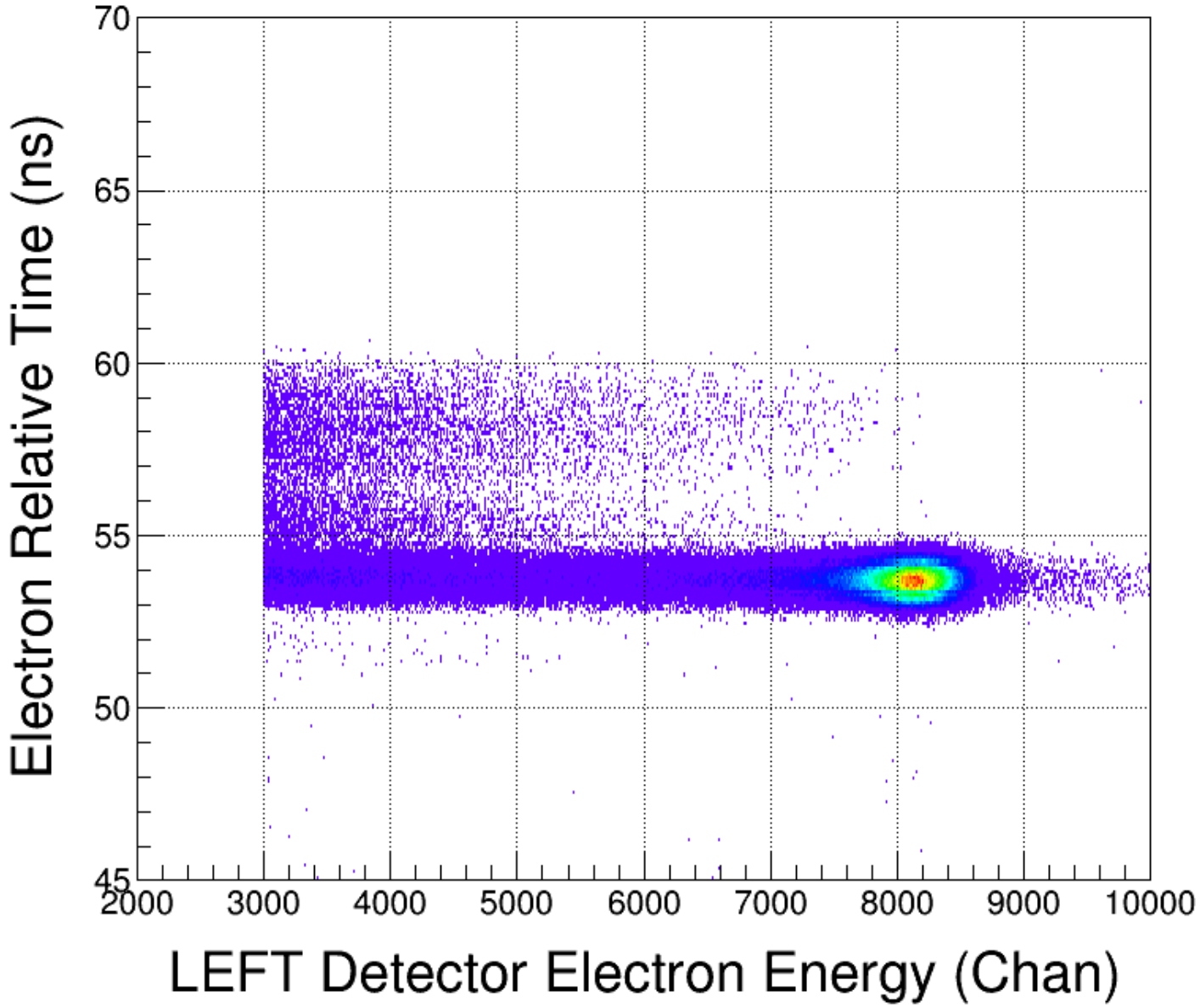
8539

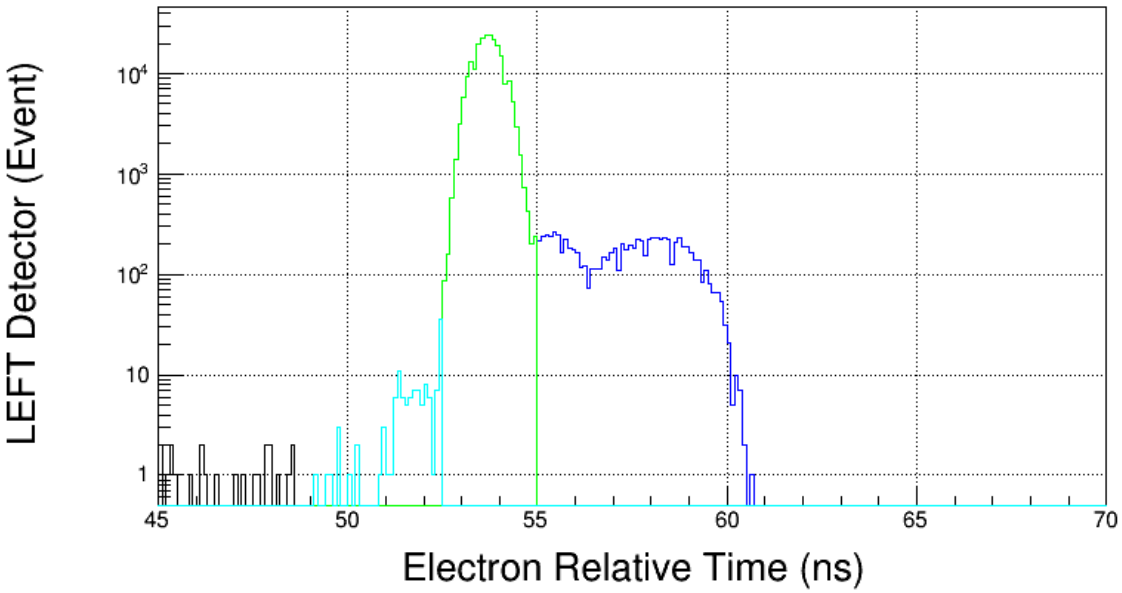

Electron Relative Time (ns)
70
65
60
55
50
45
2000
3000
4000
5000
6000
7000
8000
9000
10000
LEFT Detector Electron Energy (Chan)

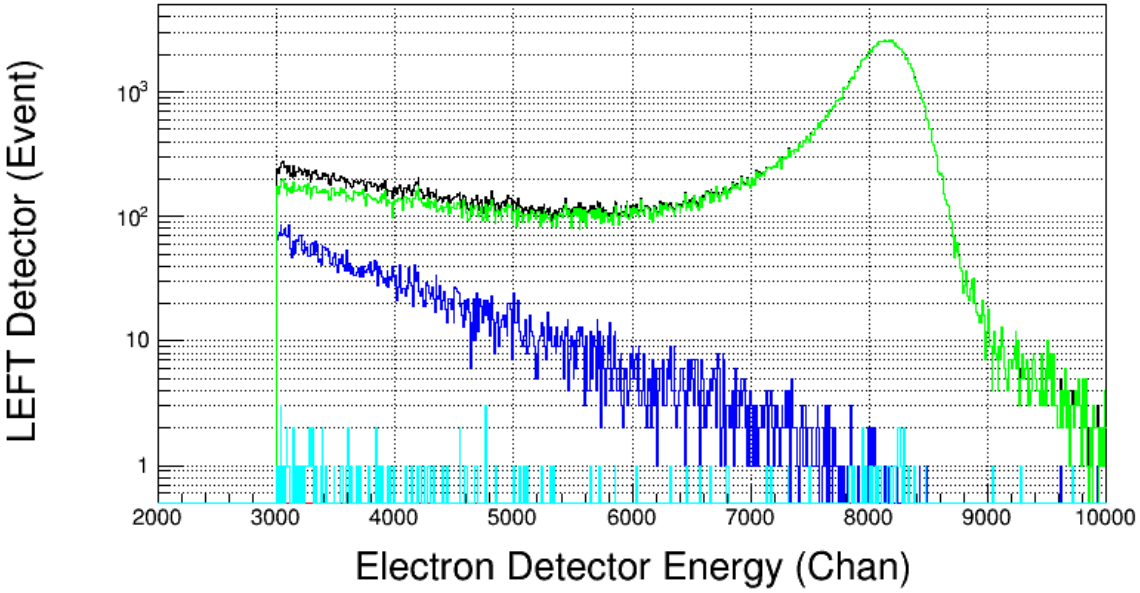

LEFT Detector (Event)
10^4
10^3
10^2
10
1
45
50
55
60
65
70
Electron Relative Time (ns)


LEFT Detector (Event)
10^3
10^2
10
1
2000
3000
4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)

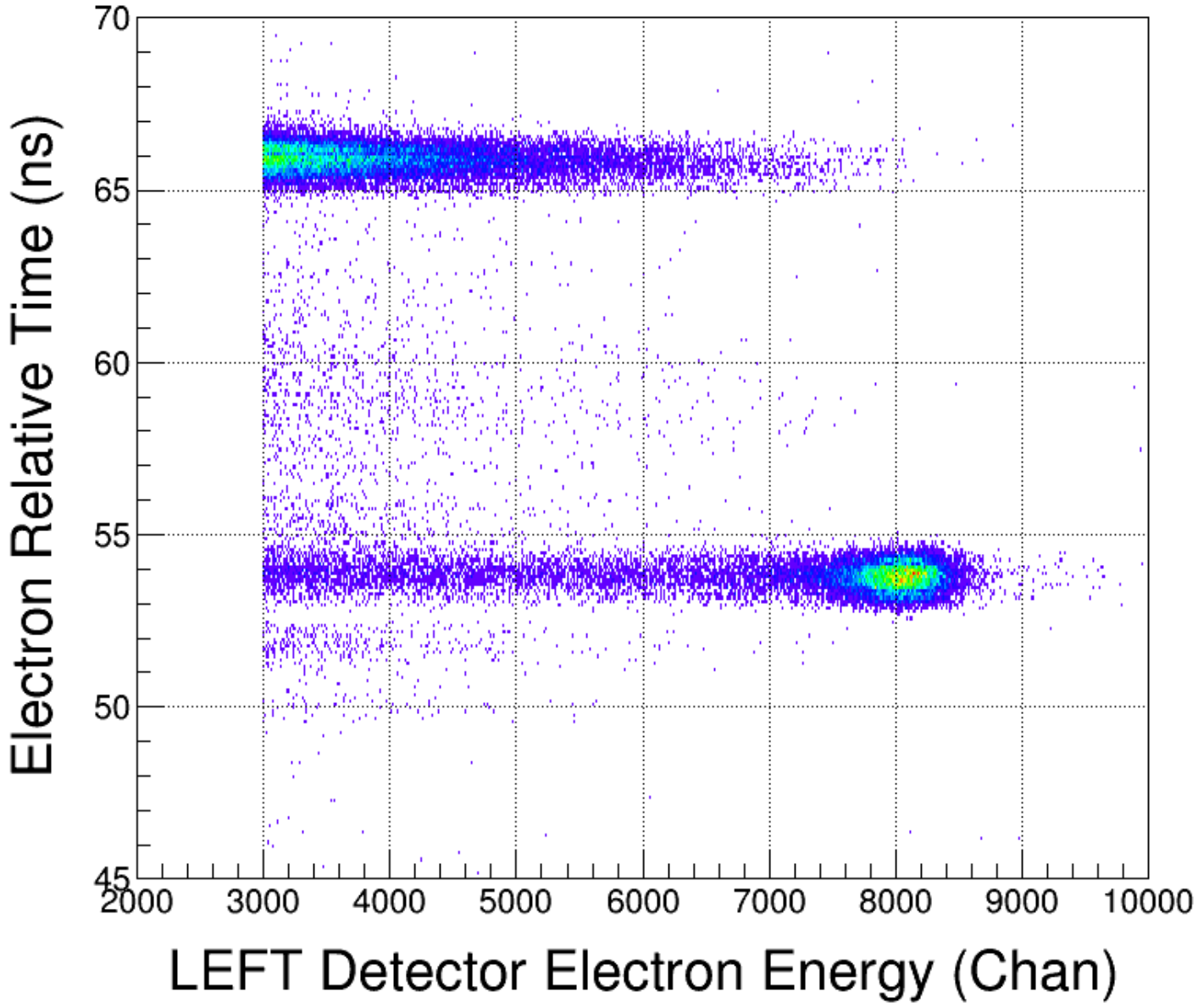
8495

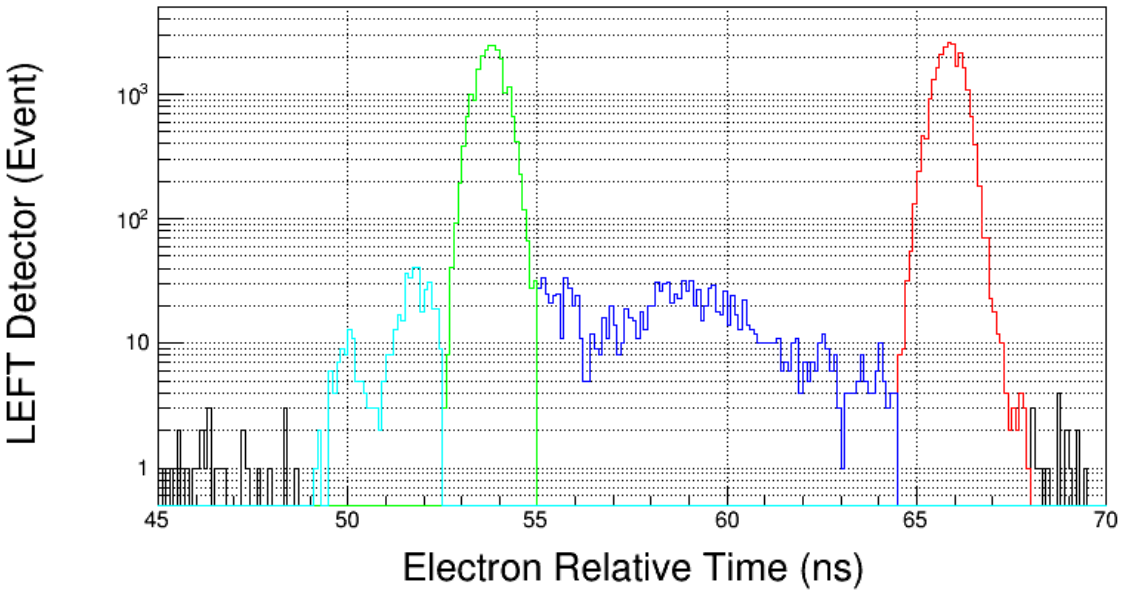

Electron Relative Time (ns)
70
65
60
55
50
45
2000
3000
4000
5000
6000
7000
8000
9000
10000
LEFT Detector Electron Energy (Chan)

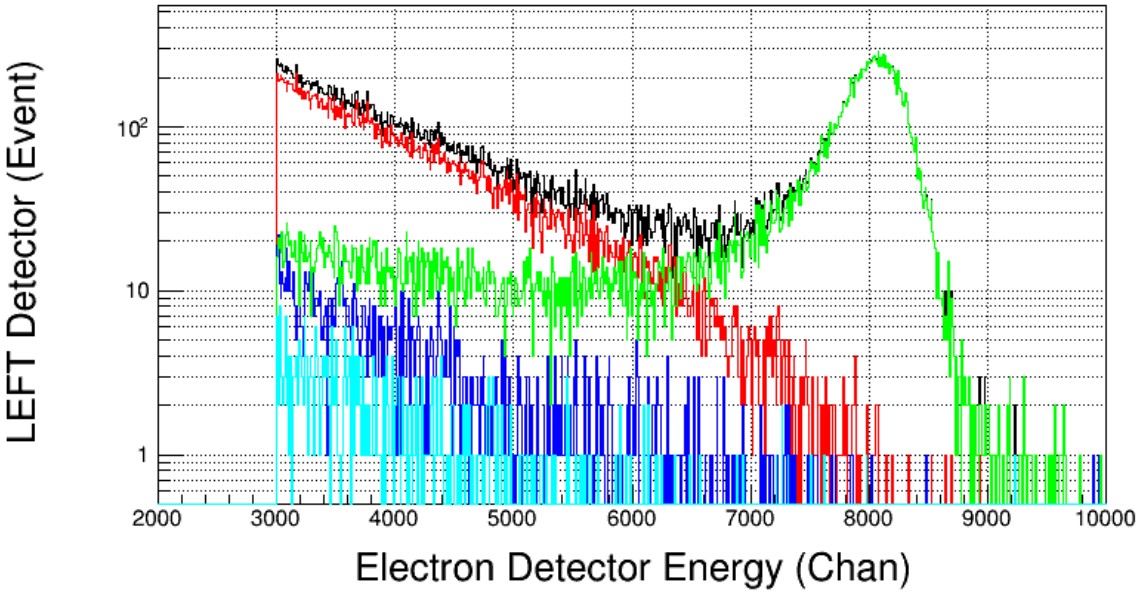

LEFT Detector (Event)
10^4
10^3
10^2
10
1
45
50
55
60
65
70
Electron Relative Time (ns)


LEFT Detector (Event)
10^3
10^2
10
1
2000
3000
4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)

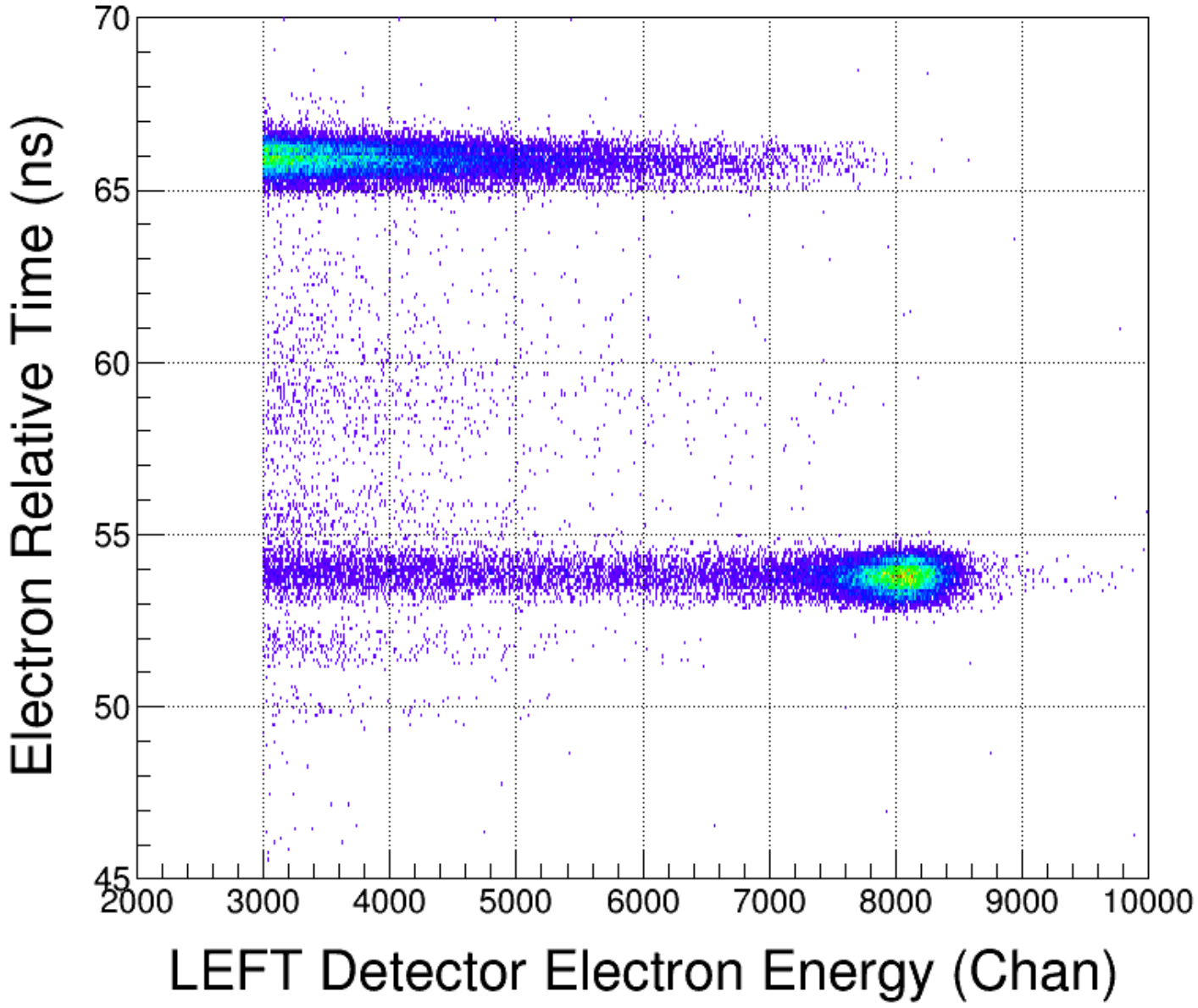
8551


Electron Relative Time (ns)
70
65
60
55
50
45
2000
3000
4000
5000
6000
7000
8000
9000
10000
LEFT Detector Electron Energy (Chan)


LEFT Detector (Event)
10^3
10^2
10
1
45
50
55
60
65
70
Electron Relative Time (ns)


LEFT Detector (Event)
10^2
10
1
2000
3000
4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)

8552


Electron Relative Time (ns)
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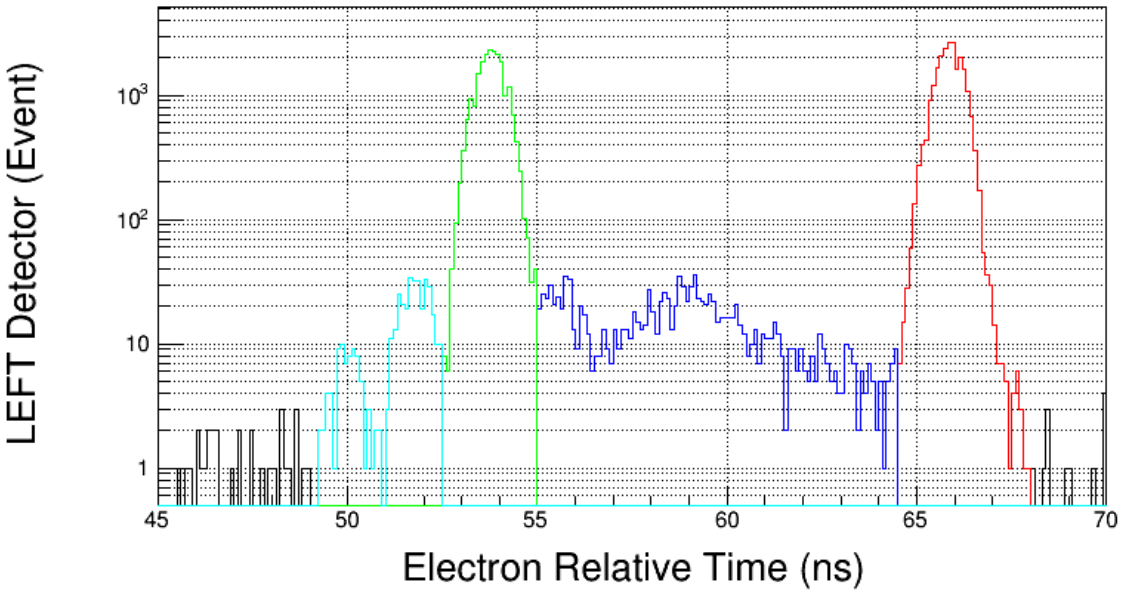
60
55
50
45
2000
3000
4000
5000
6000
7000
8000
9000
10000
LEFT Detector Electron Energy (Chan)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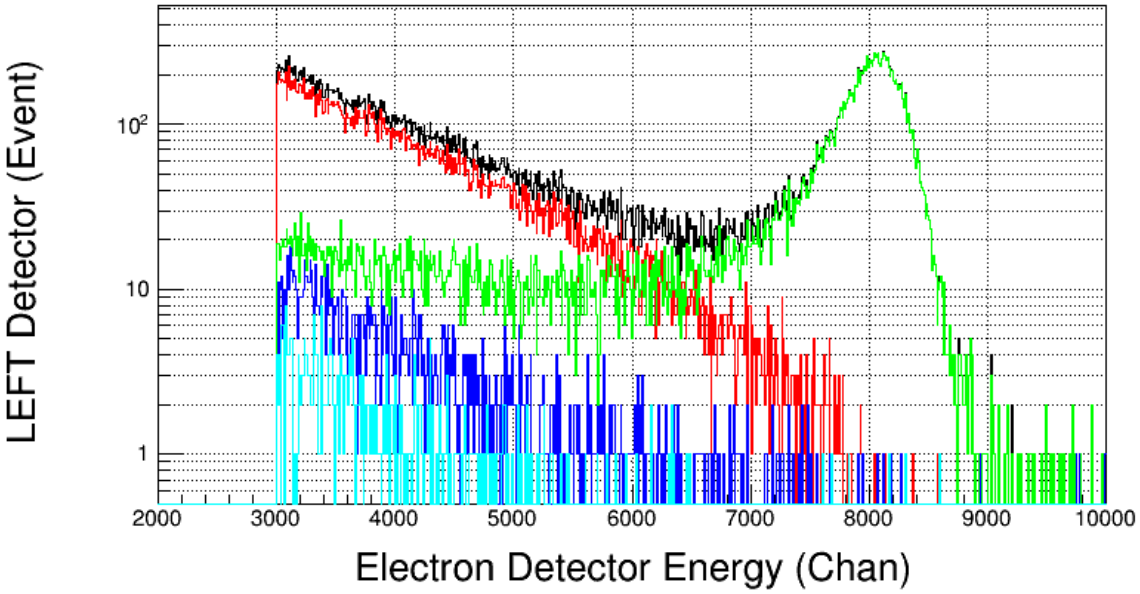
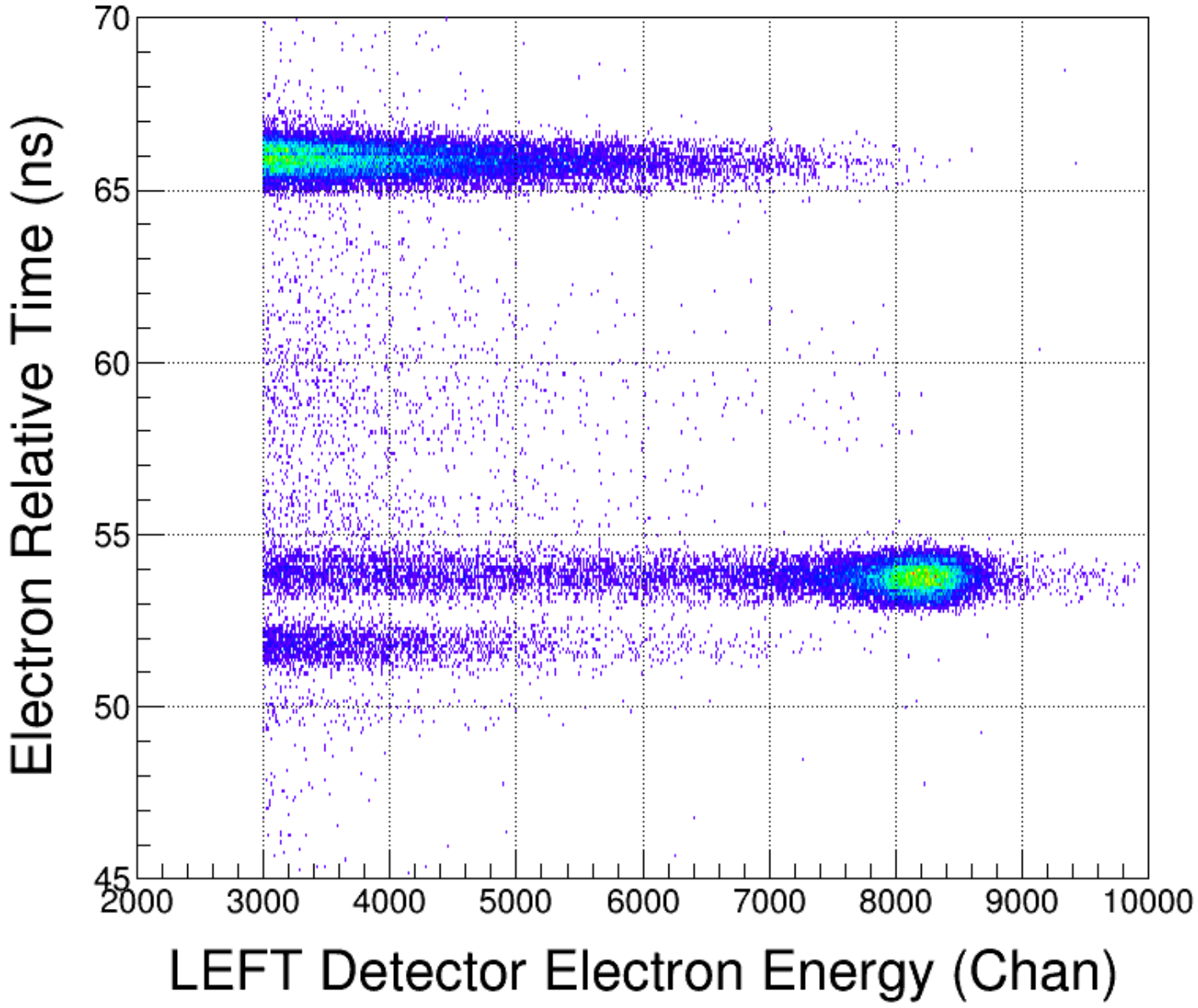
50
55
60
65
70
Electron Relative Time (ns)


LEFT Detector (Event)
10^2
10
1
2000
3000
4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)

8560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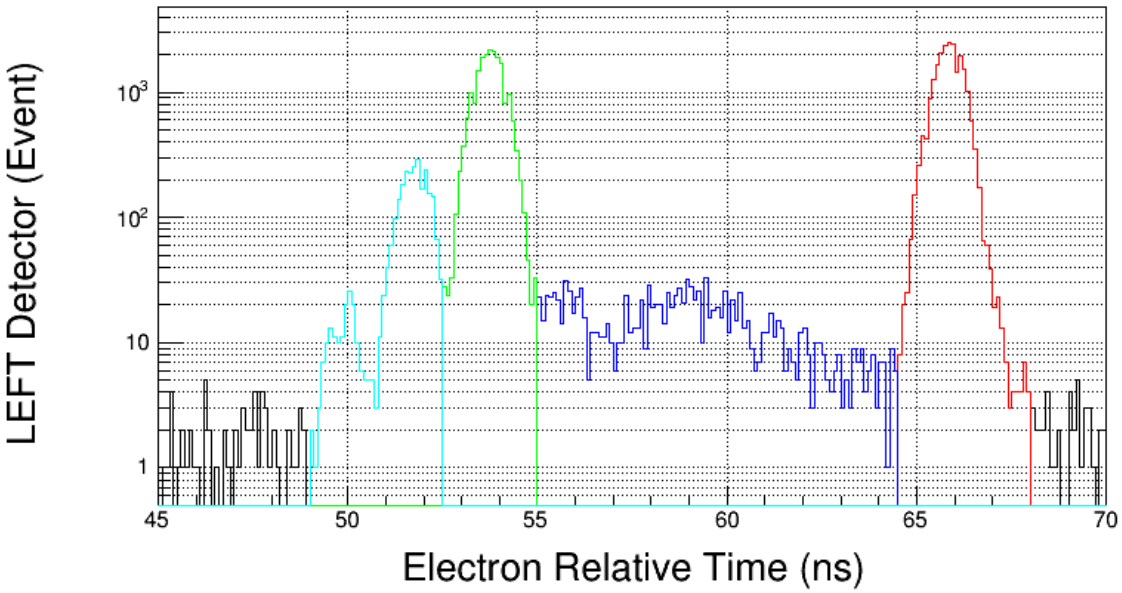
8000
9000
10000
LEFT Detector Electron Energy (Chan)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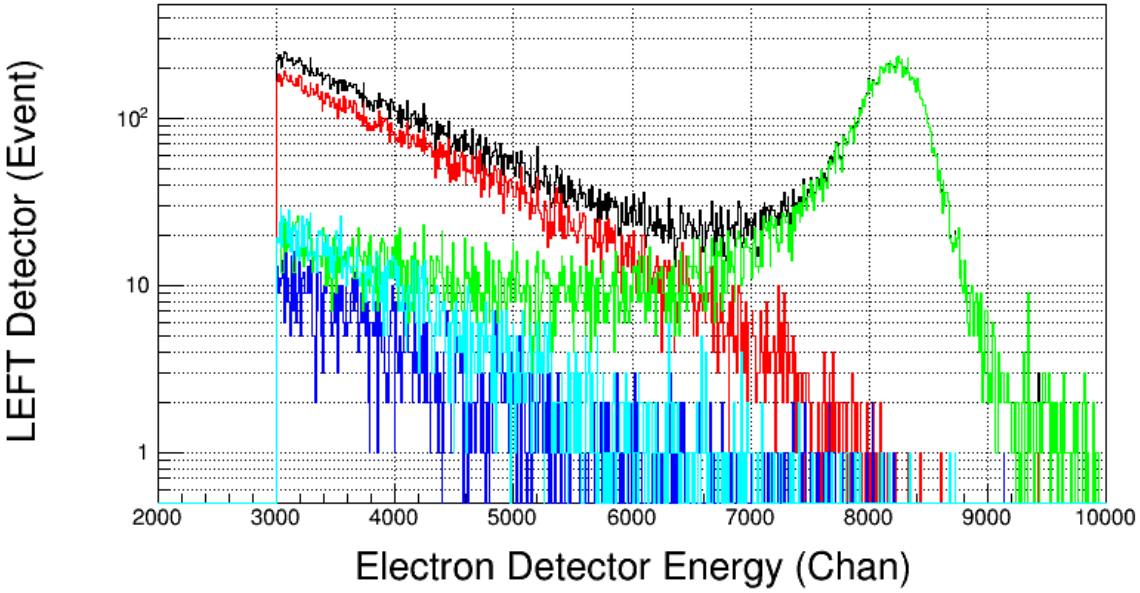
Electron Relative Time (ns)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10
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4000
5000
6000
7000
8000
9000
10000
Electron Detector Energy (Chan)